ductor. Some of the powdered substances appear to require a small spark to be passed through them before they allow a larger charge to pass, as if the particles needed polarisation.

G. H. HOPKINS

THE HERPETOLOGY OF NEW GUINEA*

DR. ADOLF BERNHARD MEYER, who, as most of the readers of NATURE will be aware, has lately returned from a very successful expedition to New Guinea, has published in the "Monatsberichte" of the Berlin Academy a short account of his herpetological discoveries, which present several points of interest. Previous investigators of the natural history of this wonderful land have paid more attention to its birds than to its reptiles and amphibians—a circumstance perhaps scarcely to be wondered at in the land of paradise-birds and so many other anomalous forms. Dr. Meyer, however, while he has by no means neglected the class of birds, as shown by his recent communications upon that branch of zoology to the Academy of Vienna, has likewise paid much attention to the representatives of the inferior orders of reptiles and batrachians which he met with in New Guinea and the adjacent islands. Although this branch of the Papuan fauna is well known to be comparatively poor, Dr. Meyer's labours have been by no means without result. Of sixty-three different forms belonging to these orders of which he collected specimens, thirty-four have turned out to be new to science; and of the remaining twenty-nine, the greater part were previously not known to occur in this locality.

Of tortoises, besides the marine *Chelone imbricata*, only one was obtained in New Guinea, which, however, was of a new species belonging to an Australian form. Of lizards, upwards of thirty species were collected, amongst which Australian types are again predominant. Amongst the sixteen serpents met with in New Guinea, Jobi, and Mysore, were several of special interest. The Australian carpet snake, *Morelia*, is represented by an allied form, proposed to be called *Chondropython*, besides which two other new genera are described, one belonging to the boas, and the other to the colubrine snakes.

Of batrachians, Dr. Meyer collected specimens of nine species in New Guinea and its islands, five of which he considers to be hitherto undescribed.

It will be thus evident that Dr. Meyer has made a by no means inconsiderable addition to our knowledge of this branch of the Papuan fauna. At the same time it cannot be supposed that we are, as yet, by any means perfectly acquainted with the herpetology of New Guinea when so little is known of the vast interior of this strange country.

COGGIA'S COMET

AN observation taken here on July 4, shows so close an agreement with the position calculated from my parabolic elements in NATURE (vol. x. p. 149), that it appears unlikely the comet can have so short a period as 137 years, and consequently that, notwithstanding similarity of orbits, it probably is not identical with the body observed by the French Jesuits in China in July 1737. Between April 17, the date of discovery, and July 4 it had traversed an arc of just 90° of true anomaly, and if any decided ellipticity existed, so wide an arc must have shown it, the stellar appearance of the nucleus having admitted of very exact observation throughout. On July 4, twenty-one days after the last position I employed in determining the orbit, the computed right ascension differs only 20″, and the declination 14″ from the observation. In all probability, therefore, the comet has not visited these parts of space within many centuries.

Measures of the diameter of the nucleus on July 4 gave nearly 14 seconds of arc, the distance of the comet at the time, by my elements, being 0·6016, which indicates a real diameter of about 3,750 miles; it has, perhaps, slightly contracted within the last fortnight.

This morning Mr. W. Plummer, at this observatory, found the comet equal in brightness to α Persei, a second magnitude star in Argelander's Atlas.

I may here mention that for calculation of actual dimensions or distances I take the sun's parallax, after M. Leverrier = 8″·86, which, combined with Capt. A. R. Clarke's value of the earth's equatorial semi-diameter, gives for the mean distance of the earth from the sun, 92,268,000 miles, a figure that I believe to be as probable as any now to be attained. The moon's mean distance from the earth, adopting Prof. J. C. Adams's parallax, is thus found to be 238,800 miles, or 60·273 equatorial radii of our globe.

J. R. HIND

Mr. Bishop's Observatory,
Twickenham, July 7

DE CANDOLLE'S PROPOSED "PHYSIOLOGICAL GROUPS" OF PLANTS

IN the *Archives des Sciences Physiques et Naturelles*, No. 197, M. de Candolle proposes a new classification of the vegetable kingdom, based on the physiological relations of plants to heat and moisture, which he believes affords a means of tracing the connections of recent and fossil floras in a way which neither botanical nor geographical grouping do. He makes six divisions altogether.

1. The first of his "physiological groups" consists of those which need much heat and much moisture, and to them he gives the name Hydromegatherm, or, for short, Megatherm. These at present live in the tropics, and sometimes as far as 30° N. and S., in warm and damp valleys, where the temperature is never below 20° C., and the rains never fail. The predecessors of the existing Megatherms were widely spread, but at the commencement of the Tertiary period they became confined pretty much to the equatorial zone. Their botanical characters vary considerably, and they are represented in almost all cases by different species in Asia, Africa, and America. The most characteristic families are Menispermaceæ, Byttneriaceæ, Ternstrœmiaceæ, Guttiferæ, Sapindaceæ, Dipterocarpeæ, Sapotaceæ, Apocinaceæ, Aristolochaceæ, Begoniaceæ, Piperaceæ, &c.

2. His second group requires heat with dryness—Xerophiles he proposes to call them. Their present distribution is in dry and warm regions of from 20° or 25° to 30° or 35° on each side of the equator (their particular districts are carefully noted). The group includes a large proportion of Compositæ, Labiatæ, Boraginaceæ, Liliaceæ, Palmæ, Myrtaceæ, Asclepiadaceæ, Euphorbiaceæ; but the most characteristic are Cactaceæ, Ficoideæ, Cycadaceæ, Proteaceæ, and Zygophylleæ. There are few large trees, few annuals, and the aspect of vegetation is but meagre. The palæontology of the regions where Xerophiles now exist is too little known for us to be able to trace the former migrations of plants forming this group.

3. The third group includes those plants which require a moderate heat, 15° to 20° C., and moderate moisture, and are named Mesotherms. They are now found around the Mediterranean, in the slightly elevated regions of India, of China, Japan, California, Central United States,

* "Uebersicht der von mir auf Neu Guinea, und den Inseln Jobi, Mysore, und Mafoer im Jahre 1873, gesammelten Amphibien." Von Dr. Adolf Bernhard Meyer. (Berlin: Monatsb. Akad., 1874.)

the Azores, and Madeira, and in the plains and low valleys of Chili, Monte Video, Tasmania, and New Zealand. Their characteristic families are the Laurineæ, Juglandeæ, Ebenaceæ, Myricaceæ, Magnoliaceæ, Aceraceæ, Hippocastaneæ, Campanulaceæ, Cistiaceæ, Philadelphiniæ, Hypericaceæ, mixed however with a large number of Leguminosa, Compositæ, Cupuliferæ, Labiatæ, &c.

4. The fourth group is of plants of temperate climates having annual means of 14° to 0° C., and these are named Microtherms. In Europe they occupy plains from the Cevennes and Alps to the North Cape, in Asia from the Caucasus or Himalaya, to 65°, in America from 38° or 40°, to 60° or 65°. They are also met with in Kerguelen, Campbell, and the Malonine Islands, and the mountains of New Zealand. No characteristic families are enumerated, as it is the absence of forms that are usually Mesotherms and above all of Megatherms or Xerophiles, which distinguishes this group.

5. The fifth group is of plants living in arctic or antarctic regions, or high on mountains in temperate regions. They need but little heat, and hence are called Hekistotherms. One of their important characteristics is that they can endure the absence of light during the time they are covered with snow. Though no family belongs entirely to this group, Mosses, Lichens, Grasses, Crucifers, Saxifrages, Roses, and Composites bear a large proportion to the whole. Some species of Betula, Salix, Empetrum, Vaccinium, and certain Conifers also are Hekistotherm.

6. The sixth group includes exceptional plants; those requiring a mean annual temperature of more than 30° C., for which the name Megistotherm is proposed.

After the description of his proposed groups, M. de Candolle at once faces an objection he sees is sure to be raised, and that is the difficulty of classing a species under any one particular group. His reply is that it is always possible to do so if due attention is paid to the conditions under which it lives, both by studying the climatal conditions of its native country, and by experimental culture. Fossil plants, he admits, can only be classed by analogy; but he very justly adds that in determining their botanic affinities in like manner there is generally nothing but analogy to rely on, flowers and fruits being wanting. In answer to the possible objection that there are transitions from one group to another, and that the limits are arbitrary, he is content to reply that though a classification based on botanical characters may be more precise, the limits of geographical groups and of geological periods are equally wanting in exactness.

The fact that his physiological groups in no way coincide with established botanical or geographical groups is worth notice. All families that are at all numerous in species are represented in more than one of these physiological groups, and sometimes in them all. To give only one instance, the Primulaceæ live in almost all cold and temperate regions, and yet the Myrsineaceæ, which are their woody representatives, are found in the tropics. Even in genera which have not many varieties of form, the same is the case. The Cassias, for example, are mostly Megatherms or Mesotherms, yet *Cassia marylandica* flourishes at Geneva, where the winter minimum is sometimes 25° C. Some willows flourish far north, yet *Salix humboltiana* is met with in the district of the Amazon, and *Salix safsaf* grows in Egypt.

Is there any connection between the physiological properties of plants and the form of their organs of vegetation? M. de Candolle thinks not. For example: there is no recognisable difference between the forms and tissues of ferns which we have to preserve in hot-houses and those which will grow in the open air. There are many facts such as these which seem to show that there is no direct relation of cause and effect between the form and those physiological qualities of plants which have reference to climatal conditions. There is rather a dependence on some common cause which has influenced both sets of phenomena, which M. de Candolle refers to heredity. A species has a particular form because its ancestors had a form more or less the same. It has certain physiological qualities with reference to climate because the exterior conditions which have been imposed on it through innumerable ages have prevented other qualities from being developed and have secured the heredity of those which have enabled it to live. This, he considers, is the key to the explanation why a flora of any particular climate does not present in the totality of its species any distinctive peculiarities. Arctico-Alpine plants are of different families, and it is impossible to point to any development of an organ which cannot also be met with in tropical plants. The ascendants of Arctico-Alpine plants have lived together, and only certain of them have lived together through changes of temperature. Physiological qualities may be changed in length of time when exterior conditions have not changed in such a way as to cause a species to perish. M. de Candolle lays great stress on the fact we learn from the experience of horticulturists, that it is much more rare to obtain any change in the power of a plant to endure modifications of climate than it is to obtain change of form. A period of greater length than the historic period of Europe seems to be needed for a modification of physiological conditions; witness the fact that for some 3,000 years the date has been grown in Greece and Italy without any success in getting the fruit to ripen. The fact that physiological conditions are so much more permanent than form is to M. de Candolle a strong argument in favour of his physiological groups. The impossibility of making geographical groups perfectly true, together with the fact that the climates of each region have changed from one period to another, is also claimed as additional argument in favour.

For the purpose of showing that these groups make the facts of geographical botany, both of geological and present times, more precise and more easy of discussion as regards general laws, their distribution in Europe since the commencement of the Tertiary period is taken as an illustration. The works of Gœppert, Heer, Unger, Garovaglio, Ch. T. Gaudin, Saporta, &c., have supplied M. de Candolle with his data, and on comparing the fossil floras with recent forms he has had no difficulty in classifying them according to his groups. He, of course, goes on the hypothesis that like forms have sprung from like antecedents possessing like hereditary physiological properties. As an illustration that any uncertainty there may be is within limits, he points out that though a fossil Ficus might be taken for a Megatherm or Mesotherm, it could never be mistaken for a Microtherm or Hekistotherm, since we do not now know any Ficus capable of resisting such cold. A fossil Betula may have been Microtherm or Hekistotherm, but not Megatherm.

Acting on these hypotheses he has reduced his results to tabular form, prefacing the remark that his great difficulty has been to class the different fossil floras according to geological periods that could be relied on; stratification and not palæontology being the only safe basis of relative age grouping.

Different climates prevailed in different parts of Europe during the Tertiary period as well as now, and he urges it must be recollected that when two fossil floras (faunas equally so) which are much alike are met with in widely separated latitudes, they cannot have been contemporaneous. In the same latitude, too, difference of elevation will have had a similar effect to difference of latitude. Floras of quite different facies may therefore have been contemporaneous.

In transcribing the following table and explanations we have given only the name of the author who has described the floras. M. de Candolle gives exact references to the works where the descriptions may be found.

Distribution of Physiological Groups in Europe since the Commencement of the Tertiary Period according to our present knowledge of Existing and Fossil Floras

Lat. N.	TERTIARY						QUATERNARY		Lat. N.
	Eocene			Miocene		Pliocene	Glacial	Recent	
	Lower	Middle	Upper	Lower	Upper				
° 90								E	° 90
85								E	85
80				? $C^{13}+D^4$			? E^4	E	80
75								E	75
70				$C^{14}+D^5$				D	70
65								D	65
60							E^1	D	60
55	A^6			C^9			D^3 E^2	D^1 D	55
50	A^5+C^{12}	? A^4 A^3+C^{11}		A^4+C^8	C^7 C^6	C^2	D^2 E^3	D	50
45			A^2+C^{10}	C^5	C^4		C^1	C+B	45
40								C+B	40
35						? C^3		B	35
30								B	30
25								B A	25
20								A	20
15								A	15
10								A	10
5								A	5
0								A	0

EXPLANATION OF THE TABLE

A.—*Megatherms.*

A. Existing Megatherms.
A^1. Beds of Monod, Paudeze (Heer). Mesotherms are mixed with Megatherms.
A^2. "Gypses d'Aix." Megatherms with Mesotherms C^{10}.
A^3. Chiavone and Salcedo (Massalongo). Mesotherms are mixed with Megatherms but the former are in large proportion.
A^4. "Sables supérieurs du Soissonnais" (Watelet), containing a large proportion of Megatherms. The stratigraphical position of these beds, it should be noted, is inferred from palæontological evidence rather than from superposition.
A^5. Bolca (Massalongo), although mixed with Mesotherms, Megatherms preponderate.
A^6. Sheppy (Bowerbank, Ad. Brongniart, Lyell).

B.—*Existing Xerophiles.*

The countries where fossil floras of this character are to be expected have not been worked geologically, and no bed containing Xerophiles is known.

C.—*Mesotherms.*

C. Existing and recent Mesotherms.
C^1. Many floras in the south-east of France worked out by Saporta.
C^2. Meximieux (Saporta).
C^3. S. Jorge, Madeira (Heer).
C^4 and C^5. South-east of France (Saporta). Some Megatherms occur in his lists, but they do not form a fourth part of each flora.
C^6. Piedmont (Sismonda).
C^7. Œningen (Heer).
C^8. Monod, Paudeze (see A^1).
C^9. Dantzig (Heer). The lower bed contains Sequoid, Smilax, Myrica, Ficus, Lauraceæ, Juglandaceæ, &c.
C^{10}. "Gypses d'Aix" (see A^2).
C^{11}. Chiavone and Salcedo (see A^3).
C^{12}. Bolca (see A^5).
C^{13}. Spitzbergen (Heer), mixed with Microtherms D^4.
C^{14}. Iceland (Heer), mixed with Microtherms D^5.

D.—*Microtherms.*

D. Existing and recent Microtherms.
D^1. Cannstadt alluvial deposits.
D^2. Laminated lignites of Durnten (Heer).
D^3. Cromer forest bed (Lyell, Heer).
D^4. Spitzbergen (Heer), mixed with C^{13}.
D^5. Iceland (Heer), mixed with C^{14}.

E.—*Hekistotherms.*

E. Existing Hekistotherms.
E^1. Southern Sweden, Denmark (Nathorst).
E^2. Mecklenburg and Cromer below the forest bed (Nathorst).
E^3. Glacial clay of Schwerzenbach—between Zurich and Constance—(Nathorst).
E^4. Superficial diluvium of Spitzbergen (Heer).

Signs.

+ When two groups are united by the plus sign it means that at least one-fourth of the flora is made up of the second group indicated.
? The note of interrogation is used to imply that the geological age of the bed is doubtful.

Setting out with the belief that at a most remote period there was all over the globe a high and nearly uniform temperature, followed by a gradual cooling and the development of diversities in climates M. de Candolle proceeds to show that the earliest plants must have been Megistotherm. With the exception of the carboniferous, we are too imperfectly acquainted with the floras of Primary and Secondary periods to trace their distribution. At the commencement of the Tertiary period Megatherms occupied all the then land surfaces up to 58°. The other groups became gradually separated, and migrated as increase of cold drove them from their former areas. The means by which this was effected is a matter of hypothesis, but it is not hypothesis to say that the various groups never sprung from a single group. It cannot be proved that there formerly existed a single form of vegetation, while M. de Candolle urges that the surface of the globe certainly had formerly one uniform climate. The distribution of physiological groups indicates two sorts of floras, one migratory, the other fixed. Intertropical floras have had but few vicissitudes, arctic and antarctic have experienced many.

We submit this *résumé* of M. de Candolle's proposal and illustration without at present offering any remarks.

NOTES

THE usual programme of the forthcoming (the 44th) meeting of the British Association at Belfast has been issued. The First General Meeting will be held on Wednesday, Aug. 19, at 8 A.M. precisely, when Prof. Williamson, F.R.S., will resign the chair, and Prof. Tyndall, F.R.S., President-elect, will assume